## CLAIMS

What is claimed is:

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1. A method of reducing multipath interference in a received composite signal comprising a plurality of multipath signals, the method comprising:

correlating the received composite signal with a PN code sequence at a time offset corresponding to a first one of the plurality of propagation paths to recover a signal of interest from a first multipath signal;

correlating the received composite signal with the PN code sequence at a time offset corresponding to a delay difference between the first multipath signal and a second multipath signal to generate a multipath interference estimate;

subtracting the multipath interference estimate from the signal of interest to reduce multipath interference.



2. The method of claim 1 further comprising:

multiplying the signal of interest by a first channel coefficient determined for the first one of the plurality of propagation paths to adjust a gain and phase of the signal of interest; and

multiplying the multipath interference estimate by the first channel coefficient and by a second channel coefficient determined for the second one of the plurality of propagation paths before subtracting the multipath interference estimate from the signal of interest to adjust a gain and phase of the multipath interference estimate.

3. The method of claim 1 further comprising multiplying the multipath interference estimate by an interference scaling factor before subtracting the multipath interference estimate from the signal of interest.

4. The method of claim 3 further comprising determining a value for the scaling factor by determining a ratio of multipath interference power in the signal of interest arising from the second multipath signal and residual interference power in the multipath interference estimate introduced during determination of the multipath interference estimate.

5. The method of claim 3 further comprising determining a value for the scaling factor that maximizes the signal-to-noise plus interference ratio (SNIR) of the signal of interest.

6. A method of reducing multipath interference in a received composite signal comprising a plurality of multipath signals, the method comprising:

correlating the received composite signal with a PN code sequence at relative time offsets corresponding to path delays associated with selected ones of the plurality of multipath signals to recover a signal of interest from each one of the selected multipath signals;

determining interference estimates for each one of the selected multipath signals caused by remaining ones of the selected multipath signals by correlating the received composite signal at time offsets corresponding to path delay differences between the multipath signals;

subtracting the interference estimates determined for the selected ones of the multipath signals from the signals of interest recovered from the selected ones of the multipath signals.

7. The method of claim 6 further comprising coherently combining the signals of interest recovered from the selected ones of the multipath signals to form a combined signal of interest, and wherein subtracting the interference estimates determined for selected ones of the multipath signals from the signals of interest recovered from the selected ones of the multipath signals comprises subtracting the interference estimates from the combined signal of interest.

8. The method of claim 6 wherein in determining an interference estimate for a first one of the selected multipath signals caused by a second one of the selected multipath signals, the step of determining interference estimates for each one of the selected multipath signals caused by remaining ones of the selected multipath signals by correlating the received composite signal at time offsets corresponding to path delay differences between the multipath signals comprises:

for all but the second multipath signal, generating a correlation output by correlating the received composite signal with the PN code sequence at a time offset corresponding to a current one of the selected multipath signals offset by a delay difference between the first and second ones of the selected multipath signals;

compensating each correlation output using channel coefficients determined for the current one of the selected multipath signals;

coherently combining each correlation output to form a raw estimate of the interference in the first multipath signal caused by the second multipath signal;

multiplying the raw estimate by a power-scaling factor to adjust a power of the raw estimate;

multiplying the raw estimate by a channel-scaling factor to scale the raw estimate with respect to the first and second multipath signals to form the interference estimate for multipath interference in the first channel with respect to the second channel.

9. The method of claim 8 further comprising:

scaling each of the interference estimates by a respective one in a set of interference estimate scalars;

combining the interference estimates after scaling by the set of interference estimate scalars to form a combined interference estimate;

combining the signals of interest to form a combined signal of interest; and

subtracting the combined interference estimate from the combined signal of interest.

10. The method of claim 9 further comprising:

observing a characteristic dependent upon the signals of interest; and

updating values of the set of interference estimate scalars based on the characteristic so as to minimize overall multipath interference in the combined signal of interest.

11. The method of claim 6 further comprising:

coherently combining the signals of interest to form a combined signal of interest;

individually scaling each of the interference estimates with a respective one of a set of interference estimate scalars;

combining the interference estimates after scaling by the set of interference estimate scalars to form a combined interference estimate; and

subtracting the combined interference estimate from the combined signal of interest to reduce multipath interference in the combined signal of interest.

12. The method of claim 11 further comprising:

monitoring the combined signal of interest after subtraction of the combined interference estimate; and

adjusting values of the set of interference estimate scalars based on monitoring the combined signal of interest to minimize a remaining amount of multipath interference in the combined signal of interest after subtraction of the combined interference estimate.

13. The method of claim 12 wherein adjusting values of the set of interference estimate scalars based on monitoring the combined signal of interest to minimize a remaining amount of multipath interference in the combined signal of interest after subtraction of the combined interference estimate comprises:

determining a multipath interference power value and a residual interference power value for each interference estimate scalar in the set of interference estimates relevant to corresponding ones of the interference estimates; and

setting a value of each interference estimate scalar based on a ratio involving the respective multipath interference power value and residual interference power value;

wherein the ratio involving the multipath interference power value and residual interference power value is adjusted to insure that the residual interference power value is always less than the multipath interference power value.

14. The method of claim 6 wherein for L selected ones of the plurality of multipath signals, the step of determining interference estimates for each one of the selected multipath signals caused by remaining ones of the selected multipath signals by correlating the received composite signal at time offsets corresponding to path delay differences between the multipath signals comprises determining L – 1 interference estimates for each one of the L selected

multipath signals, with each estimate for a current one of the L selected multipath signals representing an estimate of multipath interference in the current selected multipath signal caused by a remaining one of the selected multipath signals.

15. The method of claim 14 further comprising performing L – 1 offset correlations of the received composite signal for each one of the L –1 interference estimates, such that each one of the L – 1 interference estimates generated for each one of the L interference estimates comprises a summation of L – 1 correlation results.

16. A RAKE receiver comprising:

at least one primary RAKE finger, each adapted to recover a signal of interest from a selected multipath signal within a received composite signal comprising a plurality of multipath signals by correlating the received composite signal with a PN code at a time offset corresponding to the selected multipath signal;

at least one interference estimator, each adapted to generate an interference estimate for a corresponding one of the at least one primary RAKE finger caused by a remaining one of the plurality of multipath signals with respect to the selected multipath signal from which the corresponding primary RAKE finger recovers the signal of interest; and

a subtraction circuit for subtracting the interference estimates generated by the at least one interference estimator from the signals of interest recovered by the at least one primary RAKE finger.

17. The RAKE receiver of claim 16 wherein the at least one primary RAKE finger comprises a plurality of primary RAKE fingers, each aligned to one of a selected set of multipath signals chosen from the plurality of multipath signals in the received composite signal and each adapted to output a recovered signal of interest, and further wherein the at least one interference estimator comprises a plurality of interference estimators, each adapted to generate an interference estimate for a corresponding one of the plurality of primary RAKE fingers.

18. The RAKE receiver of claim 17 further comprising:

a signal of interest combiner to combine the signals of interest to form a combined signal of interest; and

an interference estimate combiner to combine the interference estimates to form a combined interference estimate;

wherein the subtraction circuit is operative to subtract the interference estimates generated by the at least one interference estimator from the signals of interest recovered by the at least one primary RAKE finger by subtracting the combined interference estimate from the combined signal of interest.

19. The RAKE receiver of claim 17 further comprising a plurality of interference estimate scalars, each adapted to multiply a respective one of the interference estimates by one in a set of interference estimate scale values in advance of the interference estimates being subtracted from the signals of interest in the subtraction circuit.

20. The RAKE receiver of claim 16 wherein each one of the at least one interference estimators comprises:

a plurality of secondary RAKE fingers, each adapted to generate an individual estimate of multipath interference in a first one of the plurality of multipath signals arising from a second one of the plurality of multipath signals by correlating the received composite signal with the PN code sequence at time offset corresponding to a selected one of the plurality of multipath signals shifted by a relative delay difference between the first and second multipath signals, wherein the selected multipath signal is not the second multipath signal;

a first multiplier in each secondary RAKE finger adapted to multiply the individual estimate of multipath interference by a channel coefficient determined for the selected multipath signal on which the secondary RAKE finger operates;

a combining circuit for combining the output from each secondary RAKE finger within the interference estimator to form a raw interference estimate;

a second multiplier adapted to multiply the raw estimate by a power-scaling value to form a power-scaled raw estimate;

a third multiplier adapted to multiply the power-scaled raw estimate by a channel-scaling value to form the interference estimate output by the interference estimator.

21. The RAKE receiver of claim 20 wherein there are L primary RAKE fingers corresponding to L selected multipath signals, and up to (L –1) interference estimators for each one of the L primary RAKE fingers, each of the up to (L – 1) interference estimators corresponding to a given one of the L primary RAKE fingers adapted to estimate the interference in the selected multipath signal corresponding to the given primary RAKE finger arising from a remaining one of the L selected multipath signals.

22. The RAKE receiver of claim 20 wherein the RAKE receiver is further adapted to determine the power-scaling value used in each of the at least one interference estimators based on propagation channel coefficients determined for relevant ones of the plurality of multipath signals.

23. The RAKE receiver of claim 20 wherein the RAKE receiver is further adapted to determine the channel scaling value used in each of the at least one interference estimators based on propagation channel coefficients determined for the first and second multipath signals relevant to a given one of the at least one interference estimator.

24. The RAKE receiver of claim 20 further comprising a set of interference-scaling multipliers, wherein individual ones of the interference-scaling multipliers correspond to respective ones of the interference estimates, and wherein each interference-scaling multiplier is adapted to multiply the respective interference estimate with a particular interference scale value before the interference estimates are subtracted from the signals of interest.

25. The RAKE receiver of claim 16 wherein the subtraction circuit comprises a set of individual differencing circuits, each adapted to subtract corresponding ones of the interference estimates from each of the signals of interest.

26. The RAKE receiver of claim 25 further comprising a post-subtraction combining circuit for combining the signals of interest to form a combined signal of interest.

27. A mobile terminal comprising:

a user interface adapted to allow a user to control the mobile terminal, and input local speech signals for transmission and hear remote speech signals recovered from received signals;

a transmitter adapted to transmit the local speech signals to a base station via an RF transmit signal; and

a receiver adapted to recover the remote speech signals from a received composite signal; said receiver comprising:

at least one primary RAKE finger, each adapted to recover a signal of interest from a selected multipath signal within a received composite signal comprising a plurality of multipath signals by correlating the received composite signal with a PN code at a time offset corresponding to the selected multipath signal;

at least one interference estimator, each adapted to generate an interference estimate for a corresponding one of the at least one primary RAKE finger caused by a remaining one of the plurality of multipath signals with respect to the selected multipath signal from which the corresponding primary RAKE finger recovers the signal of interest; and

a subtraction circuit for subtracting the interference estimates generated by the at least one interference estimator from the signals of interest recovered by the at least one primary RAKE finger.

28. The mobile terminal of claim 27 wherein each one of the at least one interference estimators comprises:

a plurality of secondary RAKE fingers, each adapted to generate an individual estimate of multipath interference in a first one of the plurality of multipath signals arising from a second one of the plurality of multipath signals by correlating the received composite signal with the PN code sequence at time offset corresponding to a selected one of the plurality of multipath signals shifted by a relative delay difference between the first and second multipath signals, wherein the selected multipath signal is not the second multipath signal;

a first multiplier in each secondary RAKE finger adapted to multiply the individual estimate of multipath interference by a channel coefficient determined for the selected multipath signal on which the secondary RAKE finger operates;

a combining circuit for combining the output from each secondary RAKE finger within the interference estimator to form a raw interference estimate;

a second multiplier adapted to multiply the raw estimate by a power-scaling value to form a power-scaled raw estimate;

a third multiplier adapted to multiply the power-scaled raw estimate by a channel-scaling value to form the interference estimate output by the interference estimator.

29. The mobile terminal of claim 28 wherein there are L primary RAKE fingers corresponding to L selected multipath signals, and up to (L –1) interference estimators for each one of the L primary RAKE fingers, each of the up to (L – 1) interference estimators corresponding to a given one of the L primary RAKE fingers adapted to estimate the interference in the selected multipath signal corresponding to the given primary RAKE finger arising from a remaining one of the L selected multipath signals.

30. The mobile terminal of claim 28 wherein the RAKE receiver is further adapted to determine the power-scaling value used in each of the at least one interference estimators based on propagation channel coefficients determined for relevant ones of the plurality of multipath signals.

31. The mobile terminal of claim 28 wherein the RAKE receiver is further adapted to determine the channel scaling value used in each of the at least one interference estimators based on propagation channel coefficients determined for the first and second multipath signals relevant to a given one of the at least one interference estimator.

32. The mobile terminal of claim 28 further comprising a set of interference-scaling multipliers, wherein individual ones of the interference-scaling multipliers correspond to respective ones of the interference estimates, and wherein each interference-scaling multiplier is adapted to multiply the respective interference estimate with a particular interference scale value before the interference estimates are subtracted from the signals of interest.